ACRONYM(S) SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) IO. SPONSORIMONITOR'S ACRONYM(S) II. SPONSORIMONITOR'S ACRONYM(S) III. SPONSORIMONITOR'S NUMBER(S) DISTRIBUTION / AVAILABILITY STATEMENT DIPROVED TO THE PROPERTY NOTES ABSTRACT SUBJECT TERMS SECURITY CLASSIFICATION OF: IT. LIMITATION OF ABSTRACT II. NUMBER IPA. NAME OF RESPONSIBLE PERSON IPA. TELEPHONE NUMBER IPA. NAME OF RESPONSIBLE PERSON IPA. TELEPHONE NUMBER	Public reporting burden for this collect	ction of information is a	etimated to success 4 have			OMB No. 0704-0188
authors beginned to restance the bodies became beginning of pleases. Author Date (Do-MM-YYYY) 2. REPORT TYPE Technical Papers 3. DATES COVERED (From - 7c) 3. DATES COVERED (From - 7c) Technical Papers 5. CONTRACT NUMBER 5. ORANT NUMBER 5. ORANT NUMBER 5. ORANT NUMBER 5. ORANT NUMBER 6. CONTRACT NUMBER 5. ORANT NUMBER 7. O.	maintaining the data needed, and co	mpleting and reviewing	this collection of information	response, including the time for re Send comments regarding this bur	viewing instructions	searching existing data sources, gathering and
AUTHOR(s) REPORT DATE (DD-MM-YYYY) REPORT TYPE Technical Papers 1. REPORT TYPE Technical Papers 3. ACATES COVERED (From: To) REPORT TYPE Technical Papers 3. ACATES COVERED (From: To) REPORT TYPE Technical Papers 3. ACATES COVERED (From: To) S. GRANT NUMBER 5. GRANT NUMBER 7. 3. 0. 2. 5. TASK NUMBER 7. TASK NUMBER 7. TASK NUMBER 8. PERFORMING ORGANIZATION NAME(s) AND ADDRESS(ES) REPORT MONITORING AGENCY NAME(s) AND ADDRESS(ES) 10. SPONSORAMONITOR'S ACRONYM(s) 11. SPONSORAMONITOR'S NUMBER(s) 11. SPONSORAMONITOR'S NUMBER(s) 12. SUBJECT TERMS SECURITY CLASSIFICATION OF: SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF AGEST OF PAGES (Igh) NAME OF RESPONSIBIL PERSONS NUMBER (Igh) NAME OF RESPONSIBIL PERSON 19. NAME OF RESPONSIBIL PERSONS NUMBER (Igh) NAME OF RESPONSIBIL PERSON 19. NAME OF RESPONSIBIL PERSONS NUMBER (Igh) NAME OF RESPONSIBIL PERSON 19. NAME OF RESPONSIBIL PERSONS NUMBER (Igh) NAME OF RESPONSIBIL PERSON 19. NAME OF RESPONSIBIL PERSON 19. NAME OF RESPONSIBIL PERSON 19. TELEPHONE NUMBER (Igh) NAME OF RESPONSIBLE PE	including eugenetions for radicals a th	in boundary to Dance deci-		remine nogarang and bar	och esunate of all	Ultier aspect of this collection of information
REPORT DATE (DD.MM-YYYY) 2. REPORT TYPE Technical Papers 5. CONTRACT NUMBER 5. CRANT NUMBER 5. PROGRAM ELEMENT NUMBER 7. C. S.	Highway, Suite 1204, Arlington, VA	22202-4302. Respond	lents should be aware that notw	ithstanding any other provision of	law, no person shall	be subject to any penalty for failing to comply with
Technical Papers 5. CONTRACT NUMBER 5. CONTRACT NUMBER 5. CONTRACT NUMBER 5. CONTRACT NUMBER 5. PROGRAM ELEMENT NUMBER 5. PROGRAM ELEMENT NUMBER 7.0 2 5. TASK NUMBER 7.0 2 5. TASK NUMBER 7.0 2 5. WORK UNT NUMBER 7.0 1. SPONSORMONITOR'S ACRONYM(S) 7. NUMBER(S) 7. LIMITATION OF ADMINISTRACT 7. LIMITATION OF ABSTRACT 8. NUMBER OF RESPONSIBLE PERSON SIBLE PER	DEPORT DATE (DO MA	display a currently val		SE DO NOT RETURN YOUR FOR	M TO THE ABOVE	ADDRESS.
TITLE AND SUBTITLE Sa. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER 5c. PROGRAM ELEMENT NUMBER 3c 2c. 5c. TASK NUMBER 2c. TASK NUMBER 2c. 5c. TASK NUMBER 2c. TASK NUMBER	I. REPORT DATE (DU-IVIIV	1-7777)				3. DATES COVERED (From - To)
Security Classification of: Subject terms Subje			Technical Papers			(From To)
Sb. GRANT NUMBER Sc. PROGRAM ELEMENT NUMBI Sc. PROGRAM ELEMENT NUMBI Sc. PROJECT NUMBER 3 6 2 55 PROJECT NUMBER 3 6 2 56 TASK NUMBER YII (2) 57 WORK UNIT NUMBER 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) air Force Research Laboratory (AFMC) FRL/PRS POllux Drive dwards AFB CA 93524-7048 2. DISTRIBUTION / AVAILABILITY STATEMENT POPPOVED FRL/PRS POPPOVED FRL/PRS POPPOVED FRL/PRS POPPOVED FRL/PRS POPPOVED FRL/PRS POPPOVED FRL/PRS NUMBER(S) 11. SPONSOR/MONITOR'S ACRONYMIS) 11. SPONSOR/MONITOR'S NUMBER(S) 12. DISTRIBUTION / AVAILABILITY STATEMENT POPPOVED FRL/PRS SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF ABSTRACT 19. NAME OF RESPONSIBLE PERSON LIGHAIN RUMBER OF PAGES 19. NAME OF RESPONSIBLE PERSON LIGHAIN RUMBER OF PAGES 19. NAME OF RESPONSIBLE PERSON LIGHAIN RUMBER OF PAGES 19. NAME OF RESPONSIBLE PERSON LIGHAIN RUMBER OF PAGES 19. NAME OF RESPONSIBLE PERSON LIGHAIN RUMBER OF PAGES 19. NAME OF RESPONSIBLE PERSON LIGHAIN RUMBER OF PAGES 19. NAME OF RESPONSIBLE PERSON LIGHAIN RUMBER OF PAGES 19. LIERTON RUMBER OF PAGES OF PAGES 19. LIERTON RUMBER OF PAGES 19. LIERTON RUMBER OF PAGES OF PAGES 19. LIERTON RUMBER OF PAGES OF PAGES 19. LIERTON RUMBER OF PAGES OF PAGES PERSON LIGHAIN RUMBER PERSON LIGHAIN RUMBER PERSON LIGHAIN RUMBER PERSON LIGHAI	I. TITLE AND SUBTITLE					Es CONTRACTAUMENTS
5. PROGRAM ELEMENT NUMBER 3.0.2 5. S. PROJECT NUMBER 3.0.2 5. TASK NUMBER 1/1.(2.2) 5. WORK UNIT NUMBER 5. WORK UNIT NUMBER 6. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 6. PERFORMING ORGANIZATION REPORT 6. PERFORM ORGANIZATION REPORT 6. PERFORM ORGANIZATION REPORT 7. S. PERFORMING ORGANIZATION REPORT 7. S. PERFORMING ORGANIZATION REPORT 8. PERFORMING ORGANIZATION REPORT 8. PERFORMING ORGANIZATION REPORT 8. PERFORMING ORGANIZATION REPORT 9. PERFORM ORGANIZATION OR PORT 9. PERFORM ORGANIZATION OR P						Sa. CONTRACT NUMBER
5. PROGRAM ELEMENT NUMBER 3.0.2 5. S. PROJECT NUMBER 3.0.2 5. TASK NUMBER 1/1.(2.2) 5. WORK UNIT NUMBER 5. WORK UNIT NUMBER 6. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 6. PERFORMING ORGANIZATION REPORT 6. PERFORM ORGANIZATION REPORT 6. PERFORM ORGANIZATION REPORT 7. S. PERFORMING ORGANIZATION REPORT 7. S. PERFORMING ORGANIZATION REPORT 8. PERFORMING ORGANIZATION REPORT 8. PERFORMING ORGANIZATION REPORT 8. PERFORMING ORGANIZATION REPORT 9. PERFORM ORGANIZATION OR PORT 9. PERFORM ORGANIZATION OR P				w	ļ	CL OPANE
AUTHOR(S) Sd. PROJECT NUMBER 2 3 0 2 Se. TASK NUMBER MI (G) St. WORK UNIT NUMBER PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AIT FORCE Research Laboratory (AFMC) FFRL/PRS Pollux Drive dwards AFB CA 93524-7048 SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) If Force Research Laboratory (AFMC) FFRL/PRS Pollux Drive dwards AFB CA 93524-7048 11. SPONSORMONITOR'S NUMBER(S) 12. SPONSORMONITOR'S NUMBER(S) 13. SPONSORMONITOR'S NUMBER(S) 14. SPONSORMONITOR'S NUMBER(S) 15. SUPPLEMENTARY NOTES ABSTRACT 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES PERPORT D. ABSTRACT 19a. NAME OF RESPONSIBLE PRISON Leliani Richardson Topological Product Person Trick Prison						5b. GRANT NUMBER
AUTHOR(S) Sd. PROJECT NUMBER 2 3 0 2 Se. TASK NUMBER MI (G) St. WORK UNIT NUMBER PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AIT FORCE Research Laboratory (AFMC) FFRL/PRS Pollux Drive dwards AFB CA 93524-7048 SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) If Force Research Laboratory (AFMC) FFRL/PRS Pollux Drive dwards AFB CA 93524-7048 11. SPONSORMONITOR'S NUMBER(S) 12. SPONSORMONITOR'S NUMBER(S) 13. SPONSORMONITOR'S NUMBER(S) 14. SPONSORMONITOR'S NUMBER(S) 15. SUPPLEMENTARY NOTES ABSTRACT 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES PERPORT D. ABSTRACT 19a. NAME OF RESPONSIBLE PRISON Leliani Richardson Topological Product Person Trick Prison						
AUTHOR(S) Sd. PROJECT NUMBER 2 3 0 2 Se. TASK NUMBER MI (G) St. WORK UNIT NUMBER PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AIT FORCE Research Laboratory (AFMC) FFRL/PRS Pollux Drive dwards AFB CA 93524-7048 SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) If Force Research Laboratory (AFMC) FFRL/PRS Pollux Drive dwards AFB CA 93524-7048 11. SPONSORMONITOR'S NUMBER(S) 12. SPONSORMONITOR'S NUMBER(S) 13. SPONSORMONITOR'S NUMBER(S) 14. SPONSORMONITOR'S NUMBER(S) 15. SUPPLEMENTARY NOTES ABSTRACT 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES PERPORT D. ABSTRACT 19a. NAME OF RESPONSIBLE PRISON Leliani Richardson Topological Product Person Trick Prison					İ	5c. PROGRAM ELEMENT NUMBER
Subject terms Security Classification of: 17. Limitation 18. Number 19a. Name of Responsibile Person 19a. Name of Responsibile 19a. Name of Responsibile Person 19a. Name of Re						AND THE PERIOD IN THE PERIOD PROPERTY OF THE
Subject terms Security Classification of: 17. Limitation 18. Number 19a. Name of Responsibile Person 19a. Name of Responsibile 19a. Name of Responsibile Person 19a. Name of Re	S. AUTHOR(S)					
SECURITY CLASSIFICATION OF: DESCRIPTION SUPPLEMENTARY NOTES SECURITY CLASSIFICATION OF: DESCRIPTION SUPPLEMENTARY NOTES 17. LIMITATION OF ABSTRACT OF PAGES SIPPLEMENTARY SECURITY CLASSIFICATION OF: OF ABSTRACT OF PAGES SIPPLE PHONE NUMBER (M) C. J. S. PERFORMING ORGANIZATION REPORT 10. SPONSORMONITOR'S ACRONYM(S) 11. SPONSORMONITOR'S NUMBER(S) 11. SPONSORMONITOR'S NU					1	5d. PROJECT NUMBER
SECURITY CLASSIFICATION OF: DESCRIPTION SUPPLEMENTARY NOTES SECURITY CLASSIFICATION OF: DESCRIPTION SUPPLEMENTARY NOTES 17. LIMITATION OF ABSTRACT OF PAGES SIPPLEMENTARY SECURITY CLASSIFICATION OF: OF ABSTRACT OF PAGES SIPPLE PHONE NUMBER (M) C. J. S. PERFORMING ORGANIZATION REPORT 10. SPONSORMONITOR'S ACRONYM(S) 11. SPONSORMONITOR'S NUMBER(S) 11. SPONSORMONITOR'S NU	•					2362
PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) II. FOrce Research Laboratory (AFMC) IFRL/PRS Pollux Drive dwards AFB CA 93524-7048 POLITY PRS PORT PREPORT B. ABSTRACT IT. LIMITATION OF ABSTRACT OF PAGES LIGHT REPORT B. NUMBER PREPORT 19a. NAME OF RESPONSIBLE PERSON Light Related son Light Related son 19b. TELEPHONE NUMBER (Pocked area goes)					ŀ	FO TACK NUMBER
PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AT FORCE Research Laboratory (AFMC) FRL/PRS Pollux Drive diwards AFB CA 93524-7048 SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) II. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) III. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) III. SPONSORIMONITOR'S NUMBER(S) 11. SPONSORIMONITOR'S NUMBER(S) 12. SPONSORIMONITOR'S NUMBER(S) 13. SPONSORIMONITOR'S NUMBER(S) 14. SPONSORIMONITOR'S NUMBER(S) 15. WORK UNIT NUMBER 16. PERFORMING ORGANIZATION 16. SPONSORIMONITOR'S NUMBER(S) 16. SPONSORIMONITOR'S NUMBER(S) 17. LIMITATION OF ABSTRACT OF PAGES LIMITATION OF ABSTRACT OF PAGES (Bislian Richardson 196. INTERPORT NUMBER (Both Telephone Number (Both Teleph			•		ſ	
PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AT FORCE Research Laboratory (AFMC) FRL/PRS Pollux Drive diwards AFB CA 93524-7048 SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) II. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) III. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) III. SPONSORIMONITOR'S NUMBER(S) 11. SPONSORIMONITOR'S NUMBER(S) 12. SPONSORIMONITOR'S NUMBER(S) 13. SPONSORIMONITOR'S NUMBER(S) 14. SPONSORIMONITOR'S NUMBER(S) 15. WORK UNIT NUMBER 16. PERFORMING ORGANIZATION 16. SPONSORIMONITOR'S NUMBER(S) 16. SPONSORIMONITOR'S NUMBER(S) 17. LIMITATION OF ABSTRACT OF PAGES LIMITATION OF ABSTRACT OF PAGES (Bislian Richardson 196. INTERPORT NUMBER (Both Telephone Number (Both Teleph						MIGH
PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AIR FORCE Research Laboratory (AFMC) FPCIL/PRS POllux Drive dowards AFB CA 93524-7048 SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) IF Force Research Laboratory (AFMC) FPCIL/PRS POllux Drive dwards AFB CA 93524-7048 The Pollux Drive dwards AFB CA 93524-7048 DISTRIBUTION / AVAILABILITY STATEMENT POPPOVED for public release; distribution unlimited. SUPPLEMENTARY NOTES ABSTRACT SUBJECT TERMS SECURITY CLASSIFICATION OF: OF ABSTRACT TO THIS PAGE 17. LIMITATION OF ABSTRACT OF PAGES LIGHT RUMBER (PRESON) Light Report In Jan. NAME OF RESPONSIBLE PERSON LIGHT REPORT IN JAN. NAME OF RE					ſ	5f. WORK UNIT NUMBER
ABSTRACT Terore Research Laboratory (AFMC) INTELEPRS Pollux Drive dwards AFB CA 93524-7048 SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 11. SPONSORIMONITOR'S ACRONYM(S) 11. SPONSORIMONITOR'S ACRONYM(S) 11. SPONSORIMONITOR'S NUMBER(S) 12. SUPPLEMENTARY NOTES SUBJECT TERMS SECURITY CLASSIFICATION OF: OF ABSTRACT 12. LIMITATION OF ABSTRACT OF AGES OF ABSTRACT 13. NUMBER OF RESPONSIBLE PERSON 14. LIMITATION OF ABSTRACT OF AGES OF ABSTRACT OF AGES OF ABSTRACT 15. LIMITATION OF ABSTRACT OF AGES OF ABSTRACT 16. REPORT 17. LIMITATION OF ABSTRACT OF AGES OF ABSTRACT OF AGES OF ABSTRACT 18. NUMBER OF RESPONSIBLE PERSON 190. TELEPHONE NUMBER 191. AMME OF RESPONSIBLE PERSON 190. TELEPHONE NUMBER 191. TELEPHONE NUMBER 192. MAME OF RESPONSIBLE PERSON 194. TELEPHONE NUMBER 195. TELEPHONE NUMBER 196. TELEPHONE NUMBER 197. LIMITATION 196. TELEPHONE NUMBER 198. TELEPHONE NUMBER 198. TELEPHONE NUMBER 199. TELEPHONE NUMBER						
ABSTRACT Terore Research Laboratory (AFMC) INTELEPRS Pollux Drive dwards AFB CA 93524-7048 SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 11. SPONSORIMONITOR'S ACRONYM(S) 11. SPONSORIMONITOR'S ACRONYM(S) 11. SPONSORIMONITOR'S NUMBER(S) 12. SUPPLEMENTARY NOTES SUBJECT TERMS SECURITY CLASSIFICATION OF: OF ABSTRACT 12. LIMITATION OF ABSTRACT OF AGES OF ABSTRACT 13. NUMBER OF RESPONSIBLE PERSON 14. LIMITATION OF ABSTRACT OF AGES OF ABSTRACT OF AGES OF ABSTRACT 15. LIMITATION OF ABSTRACT OF AGES OF ABSTRACT 16. REPORT 17. LIMITATION OF ABSTRACT OF AGES OF ABSTRACT OF AGES OF ABSTRACT 18. NUMBER OF RESPONSIBLE PERSON 190. TELEPHONE NUMBER 191. AMME OF RESPONSIBLE PERSON 190. TELEPHONE NUMBER 191. TELEPHONE NUMBER 192. MAME OF RESPONSIBLE PERSON 194. TELEPHONE NUMBER 195. TELEPHONE NUMBER 196. TELEPHONE NUMBER 197. LIMITATION 196. TELEPHONE NUMBER 198. TELEPHONE NUMBER 198. TELEPHONE NUMBER 199. TELEPHONE NUMBER	. PERFORMING ORGANIZ	ZATION NAME (S	AND ADDRESS/ES			1
ABSTRACT SECURITY CLASSIFICATION OF: SECURITY CLASSIFICATION OF: D. ABSTRACT 10. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S NUMBER(S) 11. SPONSOR/MONITOR'S NUMBER(S) 11. SPONSOR/MONITOR'S NUMBER(S) 12. SUPPLEMENTARY NOTES 13. SUPPLEMENTARY NOTES 15. LIMITATION OF ABSTRACT 16. SUMMER OF RESPONSIBLE PERSON Liain Richardson 19b. TELEPHONE NUMBER (Inclination of the pages) 19c. NAME OF RESPONSIBLE PERSON Liain Richardson 19b. TELEPHONE NUMBER (Inclination of the pages)			, ADDITEGG(EG)			8. PERFORMING ORGANIZATION
FRI_PRS Pollux Drive dwards AFB CA 93524-7048 SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) II. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) III. SPONSORIMONITOR'S ACRONYM(S) 11. SPONSORIMONITOR'S ACRONYM(S) 11. SPONSORIMONITOR'S NUMBER(S) 11. SPONSORIMONITOR'S NUMBER(S) 12. DISTRIBUTION / AVAILABILITY STATEMENT 13. SUPPLEMENTARY NOTES ABSTRACT SUBJECT TERMS SUBJECT TERMS SECURITY CLASSIFICATION OF: OF ABSTRACT 17. LIMITATION OF PAGES OF PAGES Lilain iRichardson 190. TELEPHONE NUMBER (Inclinate in Inclinated on Inclinated Inclinated on Inclinated on Inclinated on Inclinated on Inclinated Inclinated on Inclinated On Inclinated Inclinated on Inclinated	ir Force Desease tot-	rotom: (ATRIC	`		ļ	REPORT
Pollux Drive dwards AFB CA 93524-7048 SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) in Force Research Laboratory (AFMC) FFRL/PRS Pollux Drive dwards AFB CA 93524-7048 2. DISTRIBUTION / AVAILABILITY STATEMENT pproved for public release; distribution unlimited. SUPPLEMENTARY NOTES . ABSTRACT SECURITY CLASSIFICATION OF: OF ABSTRACT 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (Include area code) 19b. TELEPHONE NUMBER (Include area code)	TOLOG RESCRICII LADO	natory (AFMC)	•	i	+
ASSTRACT SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) ID. SPONSORIMONITOR'S ACRONYM(S) 10. SPONSORIMONITOR'S ACRONYM(S) 11. SPONSORIMONITOR'S NUMBER(S) 11. SPONSORIMONITOR'S NUMBER(S) 11. SPONSORIMONITOR'S NUMBER(S) 11. SPONSORIMONITOR'S NUMBER(S) 12. DISTRIBUTION / AVAILABILITY STATEMENT DISTRIBUTION / AVAILABILITY STATEMENT SUBJECT TERMS SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF PAGES OF ABSTRACT OF ABSTRACT OF ABSTRACT 19. NUMBER PERSON Leilani Richardson 19. TELEPHONE NUMBER (Include area code)				•	l	1
ASSTRACT SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) ID. SPONSORIMONITOR'S ACRONYM(S) 10. SPONSORIMONITOR'S ACRONYM(S) 11. SPONSORIMONITOR'S NUMBER(S) 11. SPONSORIMONITOR'S NUMBER(S) 11. SPONSORIMONITOR'S NUMBER(S) 11. SPONSORIMONITOR'S NUMBER(S) 12. DISTRIBUTION / AVAILABILITY STATEMENT DISTRIBUTION / AVAILABILITY STATEMENT SUBJECT TERMS SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF PAGES OF ABSTRACT OF ABSTRACT OF ABSTRACT 19. NUMBER PERSON Leilani Richardson 19. TELEPHONE NUMBER (Include area code)	Pollux Drive					į.
SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S NUMBER(S) 11. SPONSOR/MONITOR'S NUMBER(S) 12. DISTRIBUTION / AVAILABILITY STATEMENT 13. SUPPLEMENTARY NOTES 14. ABSTRACT 15. LIMITATION OF ABSTRACT 16. ABSTRACT 17. LIMITATION OF ABSTRACT 18. NUMBER 19. NAME OF RESPONSIBLE PERSON Liliani Richardson 19. TELEPHONE NUMBER (Include area code)		1.7048				
ir Force Research Laboratory (AFMC) FRI_PRS Pollux Drive dwards AFB CA 93524-7048 2. DISTRIBUTION / AVAILABILITY STATEMENT pproved for public release; distribution unlimited. 3. SUPPLEMENTARY NOTES 3. ABSTRACT SECURITY CLASSIFICATION OF: SECURITY CLASSIFICATION OF: TEPPORT 17. LIMITATION OF ABSTRACT 18. NUMBER PERSON Liain Richardson 19b. TELEPHONE NUMBER (Include area code)	www.no.ur.n.ch 3332	+- /U40				i de
ir Force Research Laboratory (AFMC) FRI_PRS Pollux Drive dwards AFB CA 93524-7048 2. DISTRIBUTION / AVAILABILITY STATEMENT pproved for public release; distribution unlimited. 3. SUPPLEMENTARY NOTES 3. ABSTRACT SECURITY CLASSIFICATION OF: SECURITY CLASSIFICATION OF: TEPPORT 17. LIMITATION OF ABSTRACT 18. NUMBER PERSON Liain Richardson 19b. TELEPHONE NUMBER (Include area code)	•					
ir Force Research Laboratory (AFMC) FRI_PRS Pollux Drive dwards AFB CA 93524-7048 2. DISTRIBUTION / AVAILABILITY STATEMENT pproved for public release; distribution unlimited. 3. SUPPLEMENTARY NOTES 3. ABSTRACT SECURITY CLASSIFICATION OF: SECURITY CLASSIFICATION OF: TEPPORT 17. LIMITATION OF ABSTRACT 18. NUMBER PERSON Liain Richardson 19b. TELEPHONE NUMBER (Include area code)	SPONSORING / MONITO	BING AGENCY	NAME(C) AND ADDDE	CC/EC)		
IT FORCE Research Laboratory (AFMC) FRL/PRS Pollux Drive dwards AFB CA 93524-7048 2. DISTRIBUTION / AVAILABILITY STATEMENT pproved for public release; distribution unlimited. 3. SUPPLEMENTARY NOTES 3. ABSTRACT SECURITY CLASSIFICATION OF: OF ABSTRACT 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (motude area code) 19b. TELEPHONE NUMBER (motude area code)		AULIO	NAME(2) AND ADDRE	:55(E5)		10. SPONSOR/MONITOR'S
FRI/PRS Pollux Drive dwards AFB CA 93524-7048 2. DISTRIBUTION / AVAILABILITY STATEMENT pproved for public release; distribution unlimited. 3. SUPPLEMENTARY NOTES ABSTRACT SECURITY CLASSIFICATION OF: SECURITY CLASSIFICATION OF: TO ABSTRACT 17. LIMITATION OF ABSTRACT OF ABSTRACT 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (Include area code)						ACRONYM(S)
FRI/PRS Pollux Drive dwards AFB CA 93524-7048 2. DISTRIBUTION / AVAILABILITY STATEMENT pproved for public release; distribution unlimited. 3. SUPPLEMENTARY NOTES ABSTRACT SECURITY CLASSIFICATION OF: SECURITY CLASSIFICATION OF: TO ABSTRACT 17. LIMITATION OF ABSTRACT OF ABSTRACT 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (Include area code)					i	
FRI/PRS Pollux Drive dwards AFB CA 93524-7048 2. DISTRIBUTION / AVAILABILITY STATEMENT pproved for public release; distribution unlimited. 3. SUPPLEMENTARY NOTES ABSTRACT SECURITY CLASSIFICATION OF: SECURITY CLASSIFICATION OF: TO ABSTRACT 17. LIMITATION OF ABSTRACT OF ABSTRACT 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (Include area code)	air Force Research Labo	ratory (AFMC)) .		1	1
Pollux Drive dwards AFB CA 93524-7048 2. DISTRIBUTION / AVAILABILITY STATEMENT pproved for public release; distribution unlimited. 3. SUPPLEMENTARY NOTES 4. ABSTRACT SUBJECT TERMS SECURITY CLASSIFICATION OF: T. LIMITATION OF ABSTRACT OF ABSTRACT 17. LIMITATION OF ABSTRACT OF ABSTRACT 18. NUMBER PERSON Leilani Richardson 19b. TELEPHONE NUMBER (Include area code)		• .			ļ-	
dwards AFB CA 93524-7048 2. DISTRIBUTION / AVAILABILITY STATEMENT pproved for public release; distribution unlimited. 3. SUPPLEMENTARY NOTES 3. ABSTRACT SECURITY CLASSIFICATION OF: SECURITY CLASSIFICATION OF: TO FAGES 17. LIMITATION OF ABSTRACT OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (Include area code)						
2. DISTRIBUTION / AVAILABILITY STATEMENT pproved for public release; distribution unlimited. 1. SUPPLEMENTARY NOTES 1. ABSTRACT SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (Include area code)						NUMBER(S)
SUBJECT TERMS SECURITY CLASSIFICATION OF: SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES OF PAGES PEPORT D. ABSTRACT C. THIS PAGE A 19a. NAME OF RESPONSIBLE OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)	dwards AFB CA 93524	-7048			1	
SUBJECT TERMS SECURITY CLASSIFICATION OF: SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES OF PAGES PEPORT D. ABSTRACT C. THIS PAGE A 19a. NAME OF RESPONSIBLE OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						4
SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF ABSTRACT OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (Include area code)	2. DISTRIBUTION / AVAIL	ABILITY STATE	MENT			
SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF ABSTRACT OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (Include area code)						.' i
SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF ABSTRACT OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (Include area code)						
SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF ABSTRACT OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (Include area code)	pproved for public relea	se distribution	unlimited			
SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES OF ABSTRACT OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)	provocator public refer	ise, distribution	i ummilea.			
SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES OF ABSTRACT OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)	W *	•		•		
SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES OF ABSTRACT OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)	3. SUPPLEMENTARY NOT	ES				
SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES OF ABSTRACT OF PAGES O						1
SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES OF ABSTRACT OF PAGES O			•			
SUBJECT TERMS SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES OF ABSTRACT OF PAGES O	ADOTDAOT					!
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)	ADSTRAUT			······································		
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						· i
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)			•			ì
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)				•		i
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)					4	1
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						1
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)	•					
SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)	CHD IECT TEDALO					
OF ABSTRACT D. ABSTRACT D. ABSTRACT D. ABSTRACT C. THIS PAGE A OF AGES OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)	SUBJECT TERMS					
OF ABSTRACT D. ABSTRACT D. ABSTRACT D. ABSTRACT C. THIS PAGE A OF AGES OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)						
OF ABSTRACT D. NOMBER OF RESPONSIBLE PERSON Leilani Richardson D. ABSTRACT D. A						
OF ABSTRACT D. ABSTRACT D. ABSTRACT D. ABSTRACT C. THIS PAGE A OF AGES OF PAGES 19a. NAME OF RESPONSIBLE PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)	SECURITY CLASSIFICAT	TION OF:		17		
REPORT b. ABSTRACT c. THIS PAGE OF ABSTRACT OF PAGES PERSON Leilani Richardson 19b. TELEPHONE NUMBER (include area code)	- JEROON IOA					THE PROPERTY OF THE OFFICE AND THE PROPERTY OF
D. ABSTRACT C. THIS PAGE 19b. TELEPHONE NUMBER (include area code)				OF ABSTRACT	OF PAGES	PERSON
D. ABSTRACT C. THIS PAGE 19b. TELEPHONE NUMBER (include area code)						Leilani Richardson
A (include area code)	REPORT b. AB	STRACT	c. THIS PAGE	ا حم ا		
	nclassified Uncl	accified	Unclossifical	(A]		

REPORT DOCUMENTATION PAGE

Standard Form 298 (Rev. 8-98) Prescribed by ANSI Std. 239.18 36 separate deux are enclosed

Form Approved

OMB No. 0704-0188

JON 2303M162

MEMORANDUM FOR PRS (Contractor/In-House Publication)

FROM: PROI (TI) (STINFO)

24 August 1999

SUBJECT: Authorization for Release of Technical Information, Control Number: AFRL-PR-ED-TP-FY99-0171 C.T. Liu, "Application of Real-Time X-Ray Technique to Monitor Damage Process in a Particulate Filled Composite"

Presentation at International Conference

(Statement A)

Technique to Monitor Damage Process in a Particulate Filled Elastomer Application of Real-Time X-Ray

C.T. Liu

Air Force Research Laboratory Edwards AFB, CA 93524-7680

20021119 126

Objectives



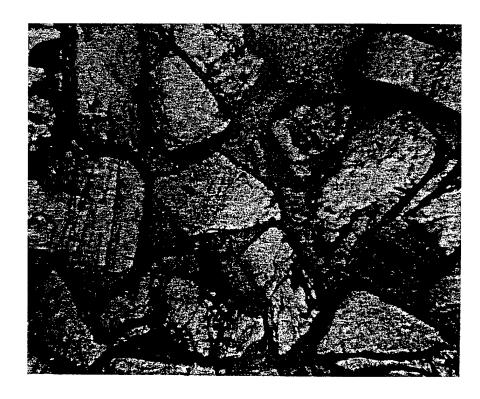
 Investigate the Effect of Damage on Crack Growth Behavior.



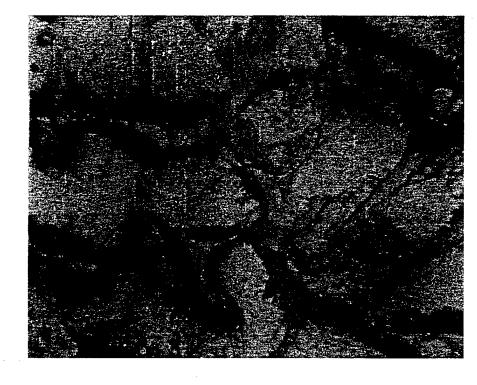


Local Dewetting About Filler Particles in Propellant

——— Direction of Strain ———

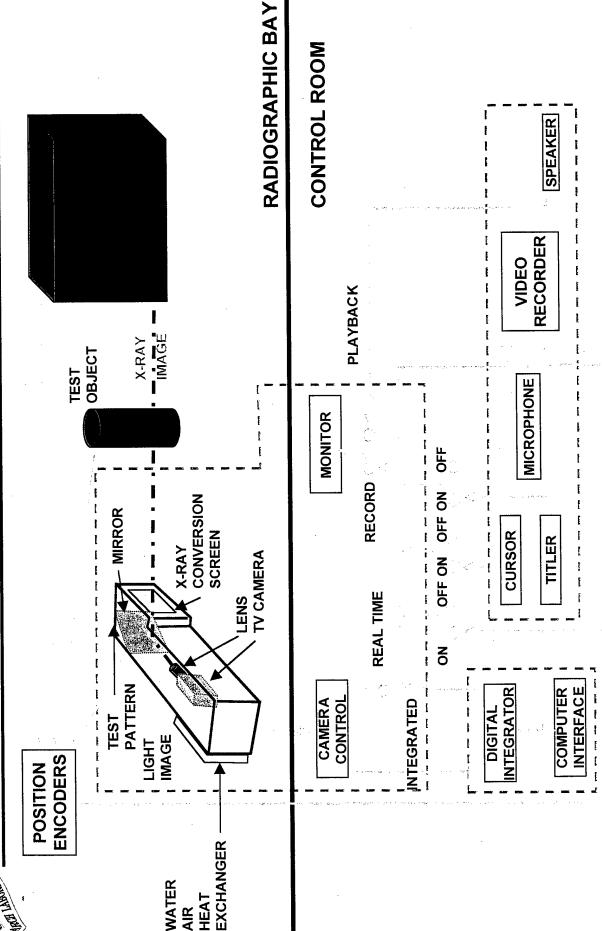






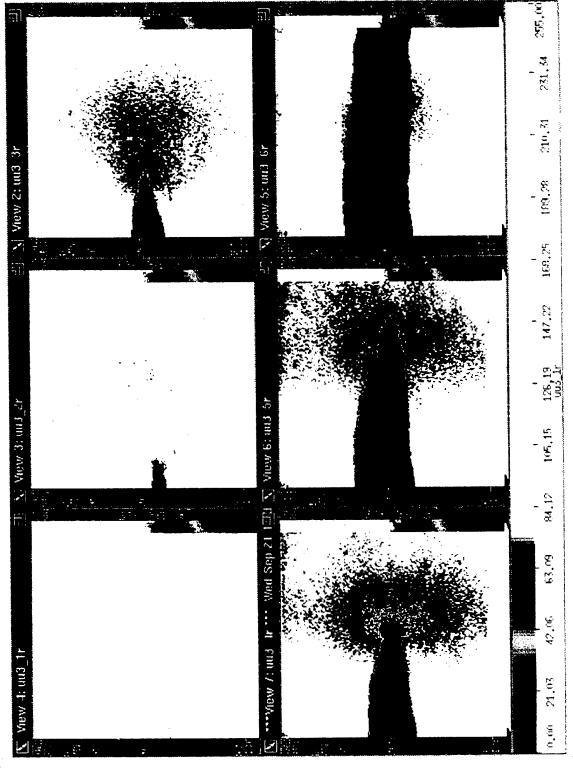
30% Strain

Block Diagram of a Real-Time Radiographic System



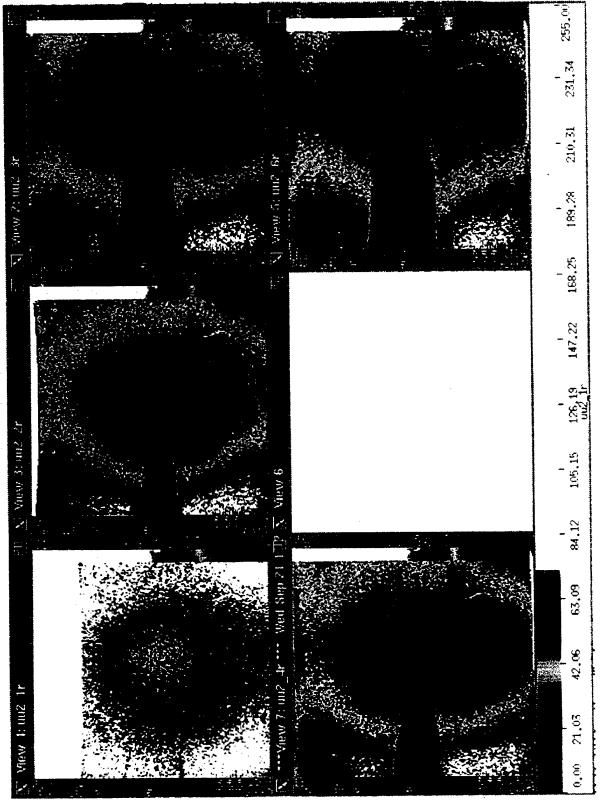


Specimen 7



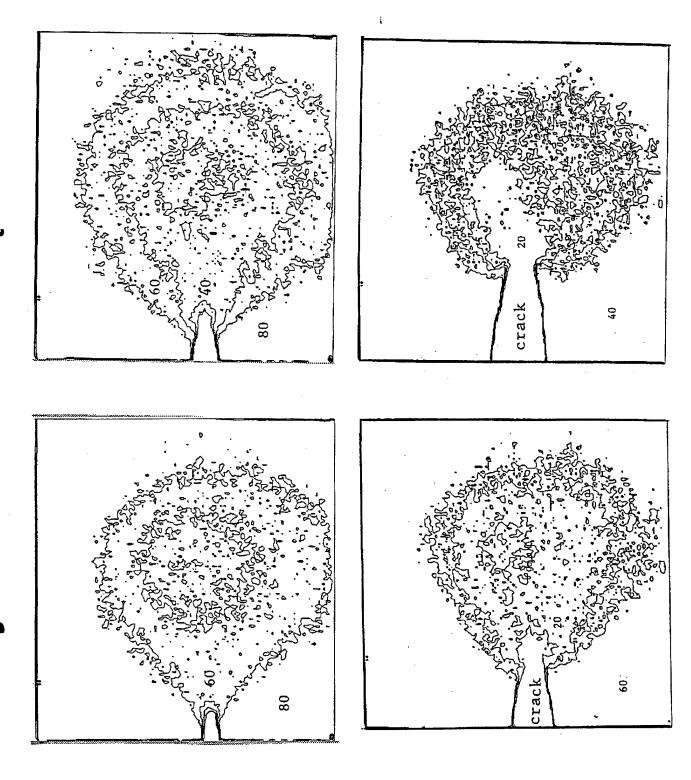


Specimen 6

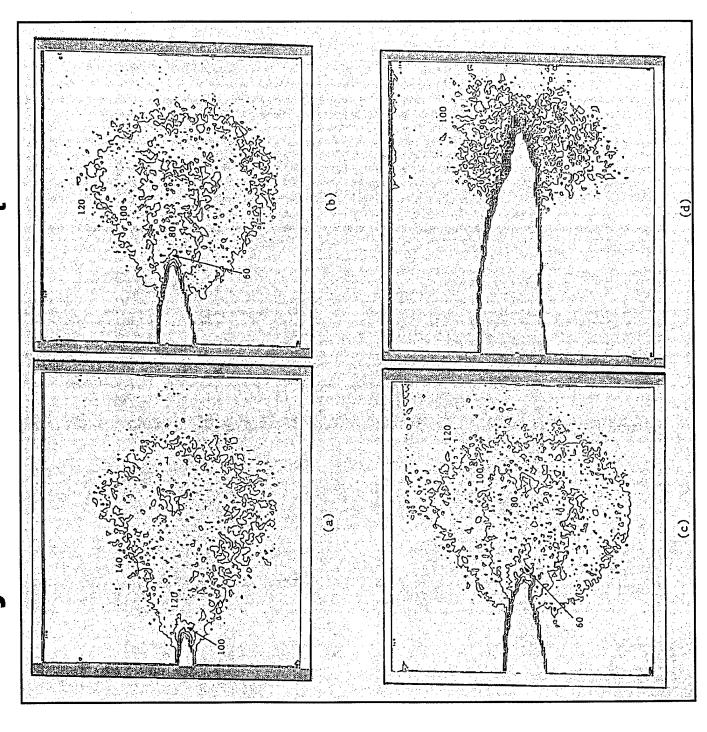




Iso-Intensity Contour Plots of I_t Near Crack Tip

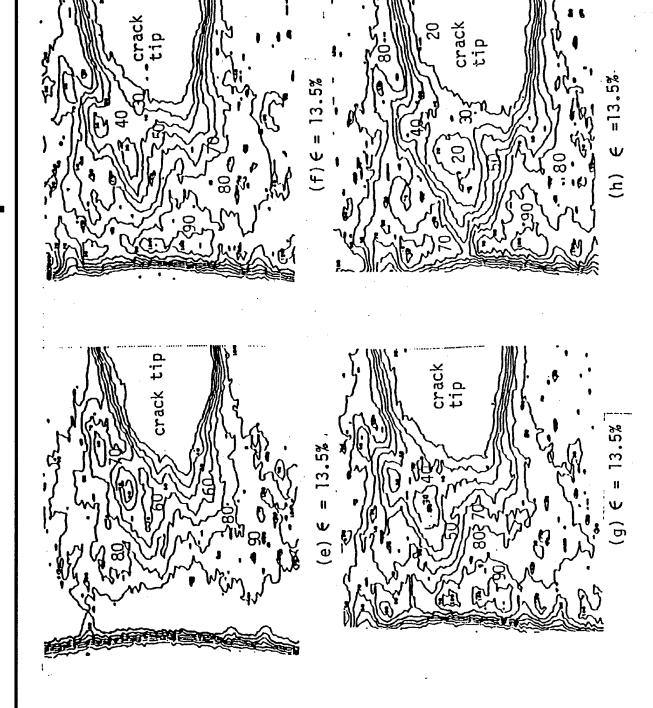


Iso-Intensity Contour Plots of I_t Near Crack Tip

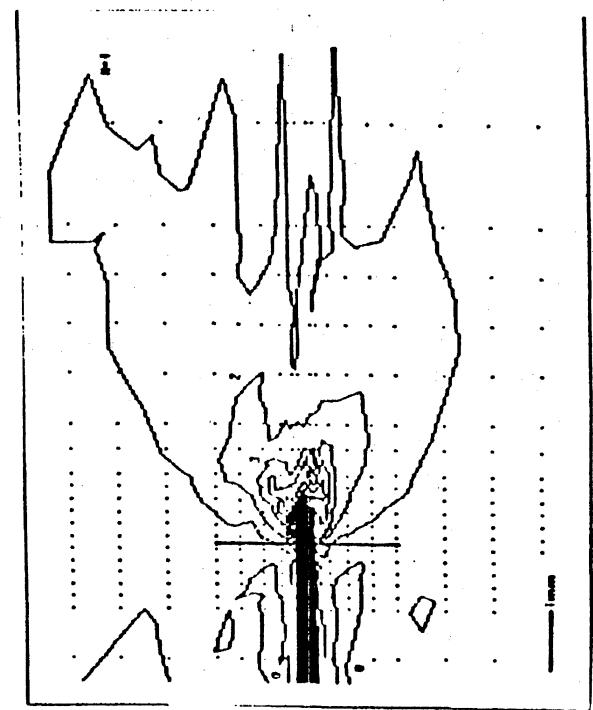


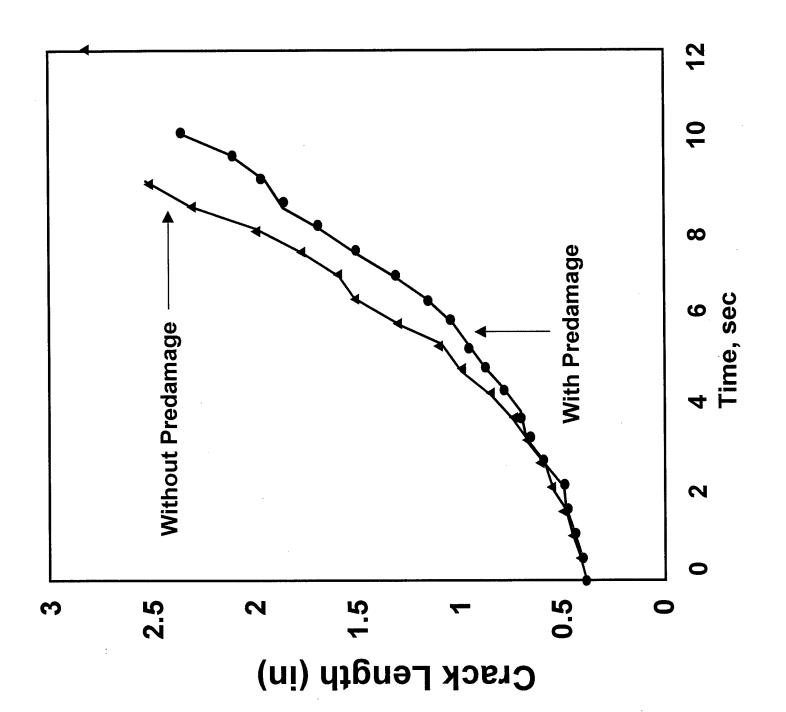


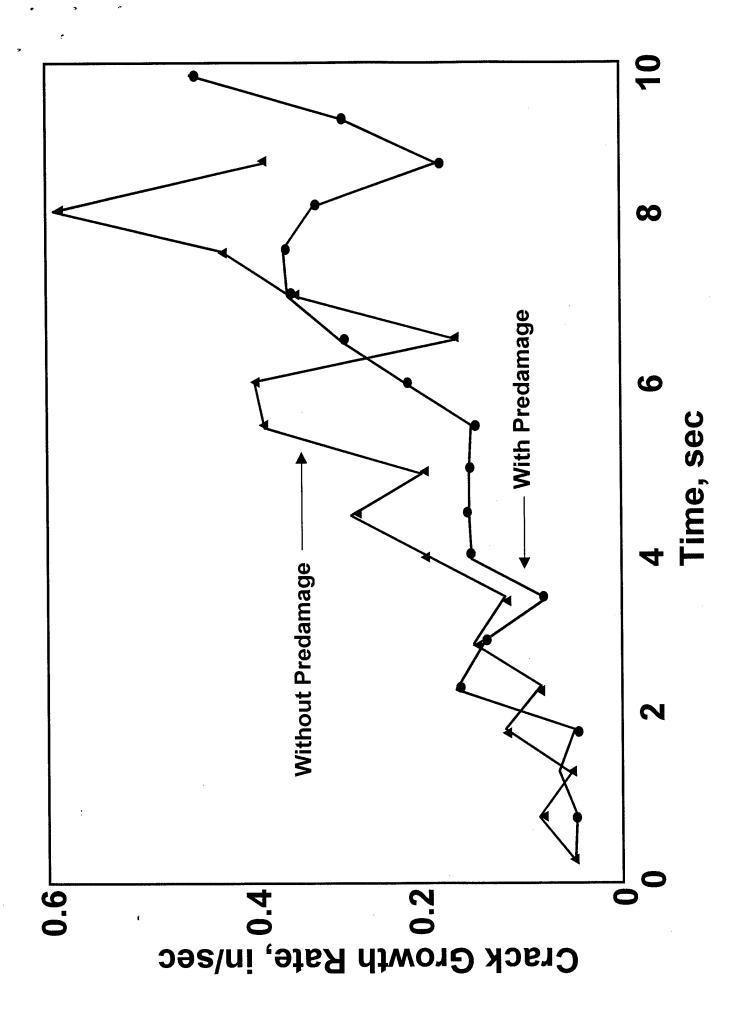
Iso-Intensity Contour Plots of It Near **Crack Tip**



Z delayer of the second
Normal Strain (Experimental Result)









Conclusions

- Under a Constant Strain Rate Loading Condition, Damage Zone Size and Intensity of Damage Increase with Increasing Time.
- Pre-Damage does Affect the Crack Growth Behavior.
- Commensurate with the Strain Distribution in the The Damage Distribution is Roughly Specimen.
- The Real-Time X-Ray Technique is a Promising **Technique to Monitor Damage Initiation and** Evolution Processes in the Material.